



U. S. Department of Energy

Office of Energy Efficiency and Renewable Energy

Toolbook

for Financing Energy Efficiency and Pollution Prevention Technologies

"Energy efficiency improvements have helped reduce our production costs and have led to business growth. This, in turn, is good for our local economic and employment picture."

– John Lessard, President, Fox River Mills

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Preface

The Department of Energy's Office of Energy Efficiency and Renewable Energy is conducting Innovative Financing Workshops and sponsoring important tools such as this book for three reasons:

- the potential for increasing the efficiency of energy use in manufacturing is enormous and largely untapped and directly impacts the bottom line;
- manufacturing is a crucial part of the U.S. economy; and,
- few conventional sources of financing focus on production process technologies.

The Importance of Manufacturing

Like an engine which drives a car, manufacturing drives the economy. At the National level, \$1 in final sales of manufactured goods generates about \$1.30 in activity in other sectors. By implication, the effect of \$1 in Gross Domestic Product (GDP) in manufacturing is to generate \$2.30 in total production. On average, each \$1 million in final sales in manufacturing is associated with 13.6 jobs in manufacturing—both the jobs to produce the final product and the intermediate products that go into it—and 8.4 jobs in other sectors such as raw materials and services. Moreover, the manufacturing sector is responsible for the majority of research and development performed in the United States—and by some estimates R&D is responsible for up to 50% of our economic growth. While manufacturers represent a vital component of the National economy, many U.S. companies falter in the increasingly competitive global marketplace.

Crane Valve

For example, Crane Valve of Washington, Iowa, a foundry and valve manufacturing facility built in the 1960s and employing 130 people received an energy audit from the local utility which indicated potential savings of \$96,000. After continuing to audit and implement process improvements for energy efficiency, waste reduction, and other productivity improvements, Crane Valve was able to:

- decrease kwh from 1,023 per ton to 727 per ton (a 29% reduction);
- increase production from 32 tons to 72 tons (a 125% increase); and,
- increase the number of employees by 24 while man hours per ton dropped from 13.5 to 5.

These dramatic results were achieved by tuning and repairing equipment, training personnel, and improving the production process from the standpoint of quality control and reducing scrap rate from 16.1% to 5.8%. Crane Valve saved \$300,00 annually, 25% from energy efficiency and 75% from production improvements and waste reduction.

Often they lack the technical and financial resources available to companies in Japan and Europe. The Office of Technology Assessment in *Making Things Better: Competing in Manufacturing* argued that the United States must improve its manufacturing technology; not only by generating new products but by teaching how to use equipment, organizing work, and managing people who make the products.

U.S. manufacturers are competing with many countries who provide their companies with low-cost, direct loans, as well as tens of billions in loan guarantees. In the United States the relationship is different. This workshop highlights the opportunities for partnering that can be critical to success in the global economy.

Often U.S. manufacturing plants were built, run until they were unproductive, and then closed down. A new state-of-the-art plant may open in a new location. But the old plants stand empty and unused, creating what's known as "brownfields" abandoned plants reminding cities of the old days. Fortunately, we have begun to understand the waste of resources inherent in this process. The staggering problems of brownfields and the sprawling greenfield development, purchasing farmland to build new manufacturing plants, attest to the associated costs. Just as companies have learned the cost advantage of recycling resources, innovators are investing in existing manufacturing plants to improve their efficiency, competitiveness, and life. Finding new enterprises to locate on abandoned plant sites presents real challenges; far better to prevent plant closures by retrofitting for efficiency.

Success stories exist. Public/private partnerships in energy efficiency and pollution prevention can be effective. In Bowling Green, Ohio, the municipal utility, the Bowling Green Community Development Foundation, and the Ohio Department of Development's Office of Energy Efficiency conducted a pilot program with four participating factories (a foundry, a hydraulic cylinder manufacturer, a metal stamping plant, and a plastic parts manufacturer) that exceeded the expectations of all of the partners. With \$48,000 from the Office of Energy Efficiency and \$4,500 each from the utility and the foundation, an outside expert conducted assessments for the plants. As a result, in the first year the companies invested \$60,000 in improvements which resulted in cost savings totaling \$400,000 annually. The investments the companies made in the first year paid back in less than four months. Yet the project benefited all the partners. The State's contribution paid back in 5 days from expanded tax revenues, to the utility in 1.5 days from utility revenues, and 2 days from local tax revenues to the local government. These results are compelling and justify efforts to make capital more available to manufacturers.

Scarce Capital for Equipment

Companies have a hard time finding capital to pay for equipment or technology for a variety of reasons: banks may be reluctant to lend money for technology they are unfamiliar with; lenders may be concerned about whether technologies will deliver the savings estimated; and many hesitate to allow the full value of equipment they do not understand for collateral. The uncertainty impedes the implementation of cost-effective efficiency improvements in two ways: good opportunities are missed because companies can't secure funding and companies may conclude that projects aren't good because they can't get capital to pursue them.

Opportunities exist to link technical providers to lenders or other financiers in order to provide objective information on a project's impact on the companies' operation and maintenance costs. One purpose of this toolkit is to help facilitate this process. Similarly, technical providers can often provide examples of companies that have installed similar technologies that can provide proof of operational impacts to lenders who are unfamiliar with the equipment. Finally, providing the financial means to companies to undertake efficiency improvements makes sense from several perspectives. As the Bowling Green example illustrates, a company that invests in enhanced efficiency, invests in its present and future viability in the marketplace. The competitiveness of small and mid-sized manufacturing underpins the local economy, yet it is this segment of manufacturing that typically has the most trouble keeping up with the pace of technological change. It often has the fewest resources on which to draw.

Why Energy Efficiency?

The potential for improving energy efficiency in manufacturing is well documented. Both the Electric Power Research Institute (EPRI) and the Congressional Office of Technology Assessment (OTA) found that U.S. manufacturers, even energy-intensive factories, could reduce energy use substantially. OTA calculated that energy intensive industry could reduce energy use by 16 to 37% with existing technology. Case studies to date suggest that substantial improvements can be made without enormous investment in new equipment or technologies. In many plants, a process of continuous improvement can utilize the savings from low-cost improvements to encourage management to consider more costly projects once the benefits of the initial investments become apparent. Rather than viewing waste—whether wasted energy or resources—as an inevitable by-product of manufacturing, waste should be viewed as a measure of plant inefficiency. Dramatic improvements in efficiency and productivity can result once employees and plant owners view their waste stream from the same cost-cutting perspective as has been afforded to “downsizing,” “rightsizing” and restructuring.

Best viewed as a goal, energy efficiency improvement becomes a process rather than a single project. An effective industrial efficiency program strives for a commitment to improvement that involves plant employees as well as management. Technologies, markets, and opportunities for manufacturers constantly change. Effective companies build a commitment to continuous improvement within the manufacturing facility. Similarly, plant employees must be motivated to participate in the plant's energy efficiency goals.

The process of making products from materials and inputs requires energy to move, mold, heat, machine, clean, pack, and ship. Typically the largest energy savings come from changes in the production process. By evaluating the use of energy in a production line with an eye to improving efficiency, other benefits often become apparent--gains in productivity and/or reduction in the generation of waste. The Crane Valve company, provides a good example of this. Similarly, many new technologies are more energy efficient than older ones.

Productivity Through Technology

Because of their success in job creation and technological innovation, small manufacturers have become the vanguard of growth and competitiveness in the U.S. economy. Technical assistance programs, therefore, typically concentrate on helping smaller firms, usually those with fewer than 500 employees. Many Federal and State technical assistance resources are available to manufacturers, but manufacturers need to realize that they have different goals (i.e., technology innovation, product development, or technology diffusion); different sectorial targets; and different quirks in terms of the nature and extent of assistance, as well as its cost.

When considering whether or not to use a public program as a technical or technology assistance partner, manufacturers need to remember the general philosophy behind all of these public-sector efforts.

Small enterprises have enormous potential to stimulate economic growth, but they also have the greatest need for technical or management advice or links to financial support. The impetus for action rests with the private sector, and manufacturers themselves need to commit to invest in improving production processes and adapting more modern technologies. Yet within this framework of private-sector action and market forces, the public sector can play an important technical information, liaison, or brokering role, enhancing private decisions with public-sector support.

A driving force behind many Federal and State efforts is bringing existing technologies to established companies that have not considered them before and this includes deployment of technologies useful to manufacturers that can help with production improvements, as well as those that can lead to operational or energy consumption efficiencies. This type of technology deployment can make these enterprises operate more efficiently, without compromising proprietary information or other company “secrets.” It also can help them establish new product lines, which can be especially important in areas where the manufacturing base is eroding and traditional producers are looking for new growth opportunities.

The toolbox provides information on several different technical assistance programs. Despite their diversity, manufacturers should be aware that they address one or more of the following four goals:

Developing new technologies and products. Many research institutions, such as Federal labs, have long traditions of research, but promoting the “commercial applicability” of those research results is a new arena for them. To encourage these institutions to promote new technologies and products, two types of technology transfer strategies typically are pursued: (1) using existing advanced technologies in new ways; and (2) supporting research to develop new technologies and help bring them to market. What this means, in practice, is that manufacturers have a window of opportunity to identify and explore a wealth of information on and opportunities for innovations that could prove quite profitable if commercialized. In the case of small and mid-sized companies, this opportunity would not be available any other way, because of cost and technical concerns.

These institutions are interested in forging new partnerships, but many are still developing their approaches to these partnerships. Therefore, manufacturers may want to take the first step, contacting these organizations, explaining their need, and working with them to identify possible joint activities. Federal agencies and local officials are encouraging such partnerships in order to enhance manufacturing activity, spin-off entrepreneurial enterprises, create and retain jobs, and increase tax revenues.

Bringing more modern technologies, processes, and efficiencies to existing industries. In several areas, notably the industrial Midwest, public-sector technology initiatives have helped existing industrial operations attract new investment capital for modernization projects. These “technology deployment” efforts are dispelling the myth that technology innovations and traditional manufacturing operations do not fit together. Federally-supported programs are credited with developing key breakthroughs in a wide range of industrial sectors, in areas such as CAD/CAM, ceramics, and welding. These breakthroughs have improved productivity in heavy industry. State programs have tallied similar achievements. Most of these efforts are aimed at helping small and mid-sized operators, unable to explore these areas on their own, adopt new and existing technologies.

Helping new and small manufacturers access the technology they need to compete. If public program experts or other technical service providers can help these firms adapt newer, more productive technologies, their ability to sustain markets and retain jobs will be strengthened, and they can continue to play an important role in community economies. Many of these companies have been founded and operated by entrepreneurs who have good ideas about what will work or sell in their area. Often, however, these entrepreneurs do not have access to the technical facilities, information, and similar resources necessary to develop, produce, and market the next generation of products or services for their traditional customer niches. A key role of technical assistance programs is to help such companies better understand how they can use technology to ensure that their products remain competitive in the eyes of customers locally and in the global marketplace. In addition, these programs allow small companies to gain access to information and facilities that only large companies can usually afford.

Easing the expansion process for firms already established, or prevent plant closings. In many cases, technical assistance programs can help firms that successfully have overcome start-up hurdles prepare to expand. Manufacturers have welcomed such programs as a reliable, neutral source of information for plant owners or managers facing critical decisions about modernization or diversification. In other situations, technical assistance programs can serve as an information lifeline for troubled manufacturers, helping them overcome identified difficulties and anticipate their needs. When long-time shop owners finally confront issues such as erosion of their customer base and obsolete production processes, they often have no place to turn for help. Given their broad web of contacts, program staff may be able to help these manufacturers develop new products and seek new markets, as well as work with creditors and suppliers to help ease the company's transition and buy it some breathing room. Technology transfer typically surfaces as a major barrier for these companies; manufacturers can use Federal and State programs to play an important role by linking the firms to the expertise and resources they need to surmount this barrier.

Depending on the program, technology development and transfer programs participate in or coordinate a series of activities in which research with commercial potential is refined and brought to market. Publicly supported programs and research and technology centers take several forms:

- research and development efforts in one industry, such as chemicals;
- comprehensive resource centers that link scientific and service networks; and
- one-stop advanced centers offering prototype development and servicing a variety of business types and sizes.

Federal technology programs, and many State initiatives, address manufacturing technical assistance needs in various ways. Some programs put formal networks in place; others arrange for small operations to share facilities and equipment with larger producers; still others encourage resource entities, such as universities, to seek out and work with prospective beneficiaries. Other programs focus on commercialization, a key part of a successful technology transfer initiative.

Successful technology development and transfer programs targeted to product development can use public-sector intervention at two stages: (1) during the early steps to stimulate research on new technologies; and (2) with subsequent efforts to promote their commercial application.

In addition, rather than concentrate solely on "high" technology, many programs have broadened their scope to focus on "advanced" technology. In the case of technology deployment initiatives, program staff will work with existing manufacturers, regardless of sector, in applying proven technological techniques to upgrade and modernize a production process, or introduce greater efficiencies into the operation.

Good technical assistance can improve business efficiency and profitability. For the many small manufacturers—machine shops, foundries, and metal workers, for example—that are owner-operated and have small profit margins, savings of as little as a few thousand dollars can have big impacts. Public program officials can improve the economic climate for these firms by serving as a conduit to needed assistance services. In fact, many of the most successful programs are those skilled in obtaining good, affordable technical assistance quickly.

This toolbox will help bridge these gaps between manufacturing and efficiency by encouraging a wide variety of people to focus on the potential that exists to improve the energy efficiency of manufacturing:

- underscoring the numerous benefits that would accompany such an approach to manufacturers, financiers, and policy makers;
- helping manufacturers work in the financial community to find the capital and other resources needed to implement production efficiencies;
- helping manufacturers better understand lenders' views of risk;
- helping financiers better understand the impact of efficiency investments on the bottom line in manufacturing; and,
- providing the resources available to reduce the perceived risk inherent in such loans.

